The Smoke Prevention and Pure Air Promotion Enterprise

PLACED UPON AN ENTIRELY NEW FOOTING, SHEWING HOW ALL STEAM USERS MAY MAKE A PROFIT FOR THEMSELVES, AND GREATLY INCREASE THE HEALTH OF THE COMMUNITY, BY ADOPTING A MACHINE THAT TAKES THE MAXIMUM OF HEAT WITHOUT SMOKE OUT OF EVERY KIND OF FUEL.

WITH A SUPPLEMENT, ENTITLED:—

"Some Aspects of the Great Question of Smoke Prevention."

THE AIR BURNING COMPANY, LIMITED,
49 North Albion Street, Glasgow.
PETER KING, Secretary.

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CONTENTS.

1. The Winding Up of the Smoke Abatement Association.

2. Great Contest between the Old Dirty Water Party and the New Pure Water Party.

3. By Filtering the Air, Smoke is found to be present, although not visible to the naked eye.

4. Pure Air is as important to Health as Pure Water.

5. The Second Digestion.

6. How is an abundant supply of Pure Air to be obtained?

7. Pure Air can only be obtained by a Summary and Severe New Law.

8. How the Smoke Producer may make a profit by obeying this Summary and Severe New Law.

9. The Annual Cost of Fuel per Boiler.

10. Mr. Henderson's Patents are suited either for Hand Firing or Mechanical Firing.

11. Testimonial from the Earl of Dudley's Round Oak Works, Birmingham.

THE SMOKE PREVENTION AND PURE AIR PROMOTION ENTERPRISE PLACED UPON AN ENTIRELY NEW FOOTING.

The Winding Up of the Smoke Abatement Association.

THE final meeting of the West of Scotland Smoke Abatement Association was a rather melancholy performance. The Directors intimated that having carried on the work for three years, they had now brought their labours to a close; but they had not been able to bring the smoke nuisance to a close. That most desirable consummation appears to be as far off as ever. The work instead of being ended, can scarcely be said to have begun. The Directors have most honourably kept their word with the public; but the public, very little to their credit, in fact very much to their discredit, have not kept their word with the Directors. The public promised to give the Directors £3000, but the public, instead of keeping their word, kept their money, and only gave the Directors about £700. With so small a sum it is surprising that the Directors were able to do as much as they did. The voluntary tax on boilers, instead of yielding a large sum, was a great failure. The owners of the boilers left the boilers themselves to pay the tax, but it was impossible for the huge mammoths to find their way through the streets to the Smoke Abatement Office. And even if, in defiance of Captain Boyd, the boilers had found their way to the office, they could not have paid the tax. They could raise steam but not cash. The conduct of the boiler owners, in declining to pay the tax, does not command admiration. On the contrary, they are accused of

having acted shabbily, but some allowance must be made for the new departure in legislation, that levies a tax of so much a boiler, but leaves the owners to pay the tax or not, just as they like. Besides, the boiler owners are men of means, and live in fine houses in the fresh air, far away from the smoke of their own chimney stalks. Then the old proverb about setting a thief to catch a thief does not hold, unless the thief employed to catch thieves has himself ceased to be a thief. So with the smoke producer. A man who is still a smoke producer himself, has no motive to catch other smoke producers.

Great Contest between the Old Dirty Water Party and the New Pure Water Party.

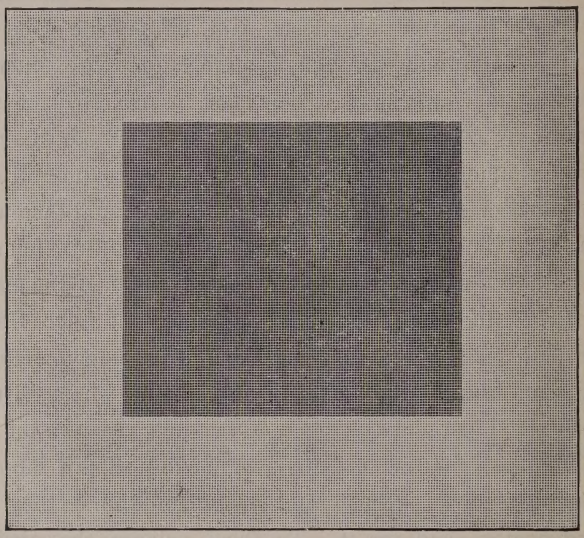
AT one time the water supply of Glasgow was taken from the Clyde, and some vestiges of the immense pumping arrangements that did the work, may still be seen on the upper reaches of the river. At that time as at present, when any controversy came to the front, there were two parties, each advocating its own scheme for improving the supply. One party contending that the then supply was on the whole very fair, and at a moderate expense, might be made good enough for all practicable purposes. The other party contending that the attempt to make dirty water pure had always been a failure, and that the right plan was to find out some place where there was an abundance of pure water ready for use, and to bring it through iron pipes into the city. The dirty water party scouted the proposal as perfectly absurd, pointed out that the expense would be enormous, and declared that no sane business man would have anything to do with so wild a scheme. The contest between the parties became as

furious as a civil war, but carried on in language anything but civil. Meantime Asiatic cholera took an active part in the discussion. The pure water party said the cholera came from the Clyde, and would continue to come until pure water was supplied to the inhabitants. The dirty water party declared that the only remedy for cholera was for everybody to wrap a piece of camphor in woollen cloth, and wear it round the neck. So the dirty water party continued to triumph, and the cholera from time to time continued its ravages. At last, Mr. Laurence Hill, C.E., of the Western Club in Glasgow, one of the leading men among the pure water party, pointed out Loch Katrine as the right place to go to for an abundant supply. He and his partner, Mr. Gordon, C.E., surveyed the whole distance between the Loch and the city, and carefully selected the best route for the laying of the pipes. They did all this laborious work at their own expense, and it is doubtful if they were ever adequately paid for it. To them belongs the credit of having initiated the great scheme that ultimately conquered the cholera. Glasgow has now an abundant supply of pure water, and the next great question that comes up for settlement is whether it is possible for Glasgow to have an equally abundant supply of pure air.

By Filtering the air, Smoke is found to be present, although not visible to the naked eye.

THE first movement in Glasgow in the direction of improving the water was to filter it. Oddly enough, the advocates of pure air for Glasgow have followed in its footsteps, and have filtered the air. In the case of water, the filter detects impurities that are quite invisible to the naked eye. In the case of air, the same startling fact is brought to light. The filter

discloses impurities that the keenest eyesight could not discover.



The place chosen for the experiments was a gentleman's house three miles out of Glasgow, far away from mills and factories, and, to all appearance, surrounded by pure fresh air. The filter employed is a mass of finely carded cotton wool, fully an inch in thickness and a foot square, neatly enclosed in a muslin bag, and so placed in connection with a fan that all the air going in to ventilate the house must pass through it. The annexed woodcut is a photographed picture of the muslin bag of wool after about three months service. The light margin shews the exact colour of the whole of the wool when placed in the frame that holds it. The dark centre shews the colour of the wool through which the air had passed, and where the smoke, which escaped the closest inspection when floating in the air, becomes plainly visible. For the sake of the public health, an abundant supply of pure air is required. The air filter is useful as a means of proving how far and wide the smoke diffuses itself, but it is too expensive an arrangement

for the general public; besides, it only purifies the air in the inside of the house, and leaves the thoroughfares in the city and suburbs as smoky as ever. Let us be thankful that the pure air of Heaven is perpetually pouring into the city, and doing all it can to penetrate every dwelling. Why then is it not to be found either in the streets or the houses? Because the smoke from thousands of tall chimneys is constantly permeating and poisoning the atmosphere! Just imagine hundreds of public works dotted all round the margin of Loch Katrine, pouring the waste refuse of their operations into the pure water. The public voice would demand that every one of them should be shut. But pure air is as important to health as pure water; in fact, in some respects it is more important, for there can be no sound digestion without pure air. Superficial observers, when they see the children in the crowded thoroughfares, with pale faces, narrow chests, bent legs, and cadaverous looks, are apt to exclaim, "poor starved things, what a pity they are not well fed!" Quite a mistake. As a rule, the children in the poorer districts of Glasgow are better fed than the same class in the country. They get more food, but, owing to the poisoned air they breathe, what they eat does them very little good. This most important fact is neither understood nor appreciated by the public, and we therefore proceed to explain it, with the view of impressing it upon the mind of the community.

Pure Air is as important to Health as Pure Water.

IT would be a very serious matter if the only way to secure a supply of pure air, was to bring it from the highland hills to the city in iron pipes of fabulous dimensions. But we have an inexhaustible supply of pure air all around the

city, that comes to us without expense, and all we have to do is not to spoil it. Instead of guarding it carefully from pollution, we allow an immense volume of smoke to diffuse itself far and wide through the air, causing great injury to the public health. If the smoke nuisance were done away with, we might expect the mortality to fall from 20 or 25 to 10 or 12 per 1000 per annum. Just imagine the outburst of public indignation that would arise, if it were discovered that through gross carelessness, the sewage had found its way into the pipes with pure water from Loch Katrine! Such carelessness would not be tolerated for a single day. But the air we breathe is as important as the water we drink, and it is high time that it should be guarded with equal solicitude. A number of gentlemen, who deserve great credit for what they do, give every year to hundreds of poor people a fortnight's holiday in the pure air. Let us hope that the anti-smoke movement will continue to flourish till the seven-hundred-thousand inhabitants of Glasgow have an abundant supply of pure air, not for a fortnight once a year, but for every day all the year round.

The Second Digestion.

IN every kind of industry there is a series of processes leading step by step to the final completion of the manufactured article. If any of these processes is mismanaged or imperfectly done, the article itself when turned out, will be found to be of an inferior quality. It is precisely the same with the health and strength of the human body. These qualities are maintained by a series of processes, including the use of food and the breathing of air. Digestion, on which life depends, consists of two different processes, called, the first digestion, and the second digestion. The theatre of the first

digestion is the stomach; that of the second digestion, the lungs. If either of these processes stops, death ensues. If either of these is imperfectly done, health is injured. The first digestion converts the food into a liquid full of nourishment, but totally incapable by itself of nourishing. The second digestion converts the liquid nourishment into a liquid still more wonderful than itself; a liquid which at one and the same time performs two most important functions. It carries nourishment to every part of the body to build it up, and it brings away from every point of the body the waste material that has delivered up its nourishment. This extraordinary liquid is the blood. At every breath we draw the oxygen of the air darts through the thin lining membrane of the lungs, combines chemically with the food, and blood full of nourishment is the result. If the air is pure, the process is perfectly performed, and health and strength are the result. But if the air is saturated with smoke, and its oxygen adulterated and diminished, the result is sickness and weakness. The disease is the failure of the second digestion. The remedy is not more food but more pure air. Suppose that the smoke nuisance, instead of deranging the second digestion, inflicted serious injury on the first digestion. Suppose that it so seriously inflamed and constricted the throat, that the children could not swallow enough of food and were in consequence always in a state of semi-starvation, the result would be exactly the same as at present. The children would have narrow chests, bent legs, pale faces, cadaverous looks and a feeble gait. But there would be this tremendous difference, as a popular saying has it, the parents would see with their own eyes that it was the smoke that was doing the mischief, and they would make a demand, seconded by the sympathetic voice of the whole community, to have it put down. And if it were put down, the present fearful rate of mortality amongst children would be cut down

by one-half; and the pitiful little skin and bone deformities, that hobble about on shanks hardly strong enough to bear the slight weight of their emaciated bodies, would be superseded by well developed chests, straight sturdy legs, blooming cheeks, and mirthful voices.

How is an abundant supply of Pure Air to be obtained?

THE pure free atmosphere is of great value, and so is the land. But the land can be laid hold of by a comparatively few persons, who hedge and fence it round, and won't allow other people to walk over it, or even to come near it. The landlords were able, with comparative ease, to squelch the "Access to Mountains" bill. Walking along the public highway in some romantic region, you enjoy the beautiful landscape around you, and you see the top of a high hill, from which you are certain there must be visible a scene of the grandest description. So you direct your steps to the top of the hill. Half way up, a gamekeeper, gun in hand, stops your progress, and orders you back to the public road. You attempt to reason with him and tell him that you are doing no harm. But he soon lets you know that you are a trespasser, and that he is there to apprehend, not your arguments, but your person. On getting back to the road and persuing your journey, you come to the stump of an old tree by the roadside, with this notice strongly nailed to it, "Trespassers will be prosecuted with the utmost rigour of law." In walking briskly along the road you indulge in various comforting reflections; as a kind of compensation for the gamekeeper's persecution. You rejoice in the fact that the pure air of heaven is one of the most valuable possessions of mankind, that it cannot be stolen or appropriated by the landlords, that it defies the encroachments of monopoly, and

loyally maintains its position as the property of the people. You also decide that on your return to town, you will lend a hand to prevent the air of Glasgow from being contaminated by smoke.

Pure Air can only be obtained by a Summary and Severe New Law.

MAHOMET was a man of good sound sense, and when he found that the mountain would not come to him, he forthwith decided to go to the mountain. So Glasgow has waited patiently for three years, expecting the smoke producers to come before the public with expressions of regret for the past, and promises of amendment for the future. But the smoke producers, like the mountain, have declined to come. Glasgow therefore must follow the example of Mahomet. She must speak to the smoke producers with a boldness that will rouse them from their sleepy indifference. She must tell them that the pure air is the birthright of every man, woman, and child, that it belongs to the whole community and must be protected from smoke pollution. The great majority of smoke producers will most likely do as they have done hitherto. They will treat such intimations with contempt. In that case, the remedy is legislation, not sham legislation, but real hard and fast legislation, that will compel the smoke producers, whether they will or no, to put a stop to the nuisance. The interest involved is the greatest interest in the United Kingdom. It is the interest of the public health, with which no man, or body of men, should be allowed to tamper. In this great reform, London leads the way. Let us follow the example of the Metropolis. **A fine for the first offence, double the fine for the second offence, treble the fine for the third offence, and so on to the end of the chapter, and the end of the smoke.** Let the second city

of the United Kingdom be as free from smoke as London, and the Clyde as free from smoke as the Thames. Let the steamers on the Clyde like the steamers on the Thames, carry on their traffic without either blurring the scenery or poisoning the air.

How the Smoke Producer may make a profit by obeying this Summary and Severe New Law.

IT would be very unfair on our part towards the smoke producers to get a law made to punish them, summarily and severely, without letting them know how they can at the least possible cost, avoid the offence and escape the punishment. We are prepared not only to do this, but also to shew them how, by a certain investment, they can obey the law and make a good profit for themselves by doing so. We are prepared to give them the full benefit of our twenty years experience, in carefully and scientifically studying how this can be done. Instead of leaving them and their managers to worry themselves and all around them, in the wearisome and expensive task of finding out which machine out of forty or fifty competitors, is the best, we at once bring before them the champion of the lot, and all that they have to do is to give their orders.

If the reader will kindly go with us to a large mill at the east-end he will have an opportunity of hearing all about the champion machine. There is the mill, and the noise you hear is the rattle of hundreds of looms converting yarn into cloth with surprising rapidity. You may watch the tall chimney stalk for hours, but you will see no smoke. Let us go along to the boiler shed and see Sandie, the fireman, whose business is to supply these powerful engines with any quantity of steam without producing any smoke.

"Well, Sandie, I see you are pegging away as usual, with plenty of steam and no nuisance."

Sandie. "Yes sir, lots o' steam and nae smoke."

"I told this gentleman that you were working the champion machine for steam producing and smoke preventing, and he wants to hear what you have to say about it, so I'll leave him with you while I go up to the counting house to ask the master about the consumption of coal."

Sandie. "All right, sir."

Gent. "Is this machine in front of the boiler your champion stoker, Sandie?"

Sandie. "Yes, sir, that's the champion."

Gent. "What's the name of it?"

Sandie. "Henderson's Patent Stoker."

Gent. "You think it is the very best?"

Sandie. "I'm sure it's the very best."

Gent. "But if it is the only stoker you ever wrought how do you know that it is better than other stokers?"

Sandie. "But I have wrought other stokers."

Gent. "There's Thingumbob's stoker, puffed and praised at a great rate. Did you ever work it?"

Sandie. "Yes, sir, I wrought it, and it was a desperate bother to me. It couldna' keep up steam, an' it sent as muckle smoke up the lum as would have made a cart o' coals. There was aye something gaun wrang wi't, and I never had ony satisfaction in doin' my wark, till I got it put out an' Henderson's put in."

Gent. "Then you are perfectly satisfied with Mr. Henderson's machine?"

Sandie. "'Deed I am, an' I'm mair than that, I'm very thankfu' to have it, for month after month, and year after year, the wark gangs on without a hitch, wi' plenty o' steam an' nae smoke."

Gent. "Then you have had it for more than a year?"

Sandie. "Mair than a year? I've had it for five or sax years, an' they've been years o' peace an' comfort, instead o' the constant worry an' vexation I had wi' Thingumbob's rattletrap."

Gent. "Then you have not spent much money on repairs?"

Sandie. "Repairs? At-weel-a-wat no! They wadna' come to mair than a shillin' a twalmonth."

At this point Sandie explained all about the working of the stoker to the gentleman, shewed him the furnaces, told him how like ither folk they cleaned theirsel's, how well-burned and few the ashes were, and sent him away highly pleased with Mr. Henderson's champion machine. The report from the counting-house about the saving in coal was very satisfactory. It shewed that in a comparatively short time the saving in coal would recoup the company for the money invested in the stokers, and after that, the saving would go into the pocket of the Company as an addition to their annual profits.

The Annual Cost of Fuel per Boiler.

BY Henderson's Mechanical Stoker the cost of evaporating an equal quantity of water, as compared with hand-firing, is reduced more than one-half, and the work done is increased 23%, while the cost of the fuel used is reduced 1/6 per ton. The cost of fuel per boiler per annum may now be estimated with these results as the data for the calculation. The year may be assumed at 300 working days, which is a pretty close approximation to actual practice.

	SMALL COAL.		SAVING.
Hand Firing,	£349 4 2		
Stoker „	272 11 0	£76 13 2	
	DUFF COAL.		
Hand Firing,	£248 8 3		
Stoker „	184 6 11	£64 1 4	

The annual saving of fuel per boiler, when small coal is used, is thus £76 13s. 2d., when, however, the hand firing with small coal is compared with stoker firing with duff coal, the saving is much greater, viz: £164 17s. 3d. per boiler.

All the observations at these numerous testing trials were made by Mr. W. J. Bird, M.E., under the supervision of Wm. Armstrong, Junr., Esq., the manager at the Wingate Grange Colliery, by whose permission they are published.

Mr. Henderson's Patents are suited either for Hand Firing or Mechanical Firing.

THE Patent Self-cleaning Fire Bars may be fired by hand, and their decided superiority to the ordinary Bars, also fired by hand, has been frequently demonstrated. An important comparative testing trial was made in April and May last year at the works of the Leeds Forge Company, with the following results :—total coal burnt, in lbs. on the ordinary bars, 15,176 lbs.; average of two trials on Henderson's bars, 19,090 lbs.; duration of test, 10 hours; total water evaporated per hour on ordinary bars, 10,000 lbs.; on Henderson's bars, average of two trials, 16,505 lbs ; lbs. of water evaporated per lb. of coal, on ordinary bars, 6·59 ; on Henderson's bars, average of two trials, 8·66; cost of evaporating 100,000 gallons of water, on ordinary bars, £38 19s. 2d.; on Henderson's bars, average of two trials, £24 5s. 5d. The saving in cost of evaporation with Henderson's bars, 27½% when coal was used, and 48% when slack was used. The increased evaporation with Henderson's bars was 62½% with coal, and 67½% with slack.

The **mechanical firing** takes place when Henderson's Stoker, a most ingenious apparatus, is combined with his self-cleaning fire bars. His system combines the advantages of both the sprinkling stoker and the coking stoker, while his fire-bars are far ahead of any other system.

The automatic action of the bars being continuous, keeps the fires open, thereby admitting a larger volume of air than

can possibly be obtained in any other furnace, and as the clinker forms, it is carried gradually onward to the back of the grate, and it falls out of the way into the chamber behind.

It is well known that much greater power is obtained from boilers after cleaning the fires; and one of the chief advantages claimed for Henderson's furnaces is, that the fires being always clean, the boilers are always doing their utmost, doing in fact about 20% more work than can be done with the same boilers fitted with the ordinary furnaces, and that with about 10% less fuel, and an absence of smoke. The chief advantages may be summed up thus: prevention of smoke, increased production of steam, economy in fuel, space and time, better combustion of fuel, no cleaning out of fires required.

Possessing such a combination of excellent qualities, we need not be surprised to learn that there are some ten thousand of Henderson's champion machines at work. Among Mr. Henderson's customers are Messrs. John Crossley & Sons, Ltd., Halifax, 58 furnaces; The Monkbridge Iron and Steel Coy., Ltd., Leeds, 20 furnaces; The Earl of Dudley's Round Oak Iron Works, 20 furnaces; Messrs. Worthington, Brewery, Burton-on-Trent, 14 furnaces; Messrs. Thos. Salt & Coy., Burton-on-Trent, 18 furnaces; The Wingate Grange Colliery, 14 furnaces; The Ryhope Coal Coy., Ltd., 13 furnaces; The Surrey Commercial Dock Coy., 17 furnaces; Sir W. G. Armstrong, Mitchell & Coy., Ltd., 10 furnaces; The Corporation of Birmingham, 24 furnaces; Messrs. A. Knowles & Sons, Ltd., Pendlebury, 44 furnaces of automatically worked bars, and 14 furnaces worked by hand at their collieries; The Leeds Forge Coy., Ltd., 20 furnaces; The Ford Paper Works, Ltd., Sunderland, 18 furnaces; Messrs. Eckersley & Co., Wigan, 8 furnaces.

In Glasgow the Henderson Mechanical Stokers are working successfully, and giving great satisfaction at the mills of the Clyde Spinning Company, and at the weaving factory of Messrs. A. P. Bird & Co.

A characteristic feature of the Henderson appliances is that they are suitable for every place and every purpose. Wherever steam is to be raised, and whether the firing is by hand or power, the Henderson Bars and Stokers are the cheapest and most efficient machines. Whether the fuel used is large coal or small coal, slack, dross, nuts, duff, coal dust, wood chippings, or sawdust, the only machines that can make steam without smoke out of all these fuels are Henderson's Champion Bars and Stokers.

By adopting the Henderson appliances, the Steam users will accomplish two very important objects. First, they will increase the profits of their own business, and last, but by no means least, they will greatly contribute to increase the public health.

The Clinker, instead of being raked out of the furnace in the usual way by hand, is carried automatically to the back of the grate bars, and remains there till cool, when it is removed without the furnace doors requiring to be opened.

Testimonial from the Earl of Dudley's Round Oak Works, Birmingham.

I HAVE much pleasure in stating that the Stokers you have fixed at these works are giving most satisfactory results. The first you put down convinced me that we could use it for burning the fine siftings or dust from the slack; and those you have since erected have fully confirmed me in that opinion, for not only do we now use the siftings we could not previously burn at all, but

the generation of steam is so rapid that we have discontinued using one of the boilers, finding we can obtain by the use of your machine, quite as much steam from three boilers as we previously could from four.

R. SMITH CARSON.

The value of the fuel saved by Henderson's Mechanical Stokers very considerably exceeds £180,000 per annum, and the saving is constantly increasing. Those who send in their orders for Henderson's Stokers will receive their share of this great saving.

For further particulars and prices please apply to The Air Burning Coy., Limited, Glasgow, Mr. Henderson's Representatives for Scotland and Ireland. Orders promptly executed, and firms ordering may rest assured that a competent mechanic will be sent to fit up and start the machinery to their entire satisfaction.

All enquiries regarding Stokers and Fire-bars promptly attended to by Mr. Peter King, Secretary, The Air Burning Company, 49 North Albion Street, Glasgow.

Some Aspects of the Great Question of SMOKE PREVENTION.

PATENTEES FOR
PURE HEAT,
THE MILDEST TO THE MOST INTENSE,
FOR ALL PURPOSES.

The Air Burning Company, Ltd.

Gas Calenders, Gas Irons, Fans and Laundry Appliances,

49 NORTH ALBION STREET, GLASGOW.

Some Aspects of the Great Question of SMOKE PREVENTION.

FROM Tinto on the east to the Kilpatrick Hills on the west, from Neilston Pad on the south to Dumgoyne on the north, the pure air of heaven, in countless volumes, is perpetually flowing into Glasgow, filling every street, however long, every lane, however narrow or crooked, every house, however large or however small, with that prime necessary of human existence, *fresh air*. How comes it that, with a supply that is inexhaustible, that needs no filtering, that requires no expensive system of pipes to bring it into the city, that not only comes carriage free, but that forces itself into every nook and cranny of Greater Glasgow, how comes it that, with such a supply of fresh air, thousands of the inhabitants should perish every year for want of it? The reason is not difficult to discover. The pure air from the hills is poisoned and polluted by the smoke from the chimneys of hundreds of public works.

Why is Impure Air so destructive to the Public Health?

It is impossible to exaggerate the importance of this question, and the gentlemen to whom we should look for a satisfactory reply are the medical men. But we should certainly look in vain to that class for such a reply. The modern doctor is educated up to his ears in the use of professional technical phrases, and any explanation from him as to why Impure Air is so very destructive to the public health would puzzle without enlightening the most intelligent members of the community, and would leave the mass of the people in the densest ignorance. There is no use, therefore, expecting any help from that quarter. And yet no explanation, however sound, would have any influence on the public mind, unless it was endorsed by medical authority. We must, therefore, try to get the explanation from some eminent physician, endowed with a philosophical intellect. There are some eminent living members of the profession who deserve to be placed in the class referred to. But it would be invidious to name them. Besides, they might decline to occupy so prominent a position. We must, therefore, look back for many years, and study the teachings of famous physicians of bygone generations, in the hope that we shall find a clear, intelligible, and thoroughly scientific answer to the great question, "Why is Impure Air so terribly destructive to the Public Health?" William Cullen, one of the ablest professors of medical science this country has produced, flourished one hundred years ago, when all over Europe medical men believed that for all diseases bleeding was the right remedy—a remedy that killed a great many more than it cured. Cullen, with irresistible arguments and extraordinary eloquence, denounced and destroyed this most mischievous belief, and to him belongs the glory

of having rescued the civilised world from its life-destroying domination. During his professorship in Glasgow University he threw aside the Latin language and delivered his lectures in vigorous English to the great delight of the students, with whom he was a special favourite. On glancing over his writings, we do not find any essay on the effects of air on the human system, and we must, therefore, continue our search for some high authority, who has thrown a clear light on that most important subject. Going seventy years farther back than the period when Cullen flourished, we come in sight of some gigantic figures in the medical world. We see Garth, and Mead, and Sir Henry Halford, and Radcliffe, all eminent physicians, and with a breadth of culture extending far beyond the technicalities of the medical craft. They were perhaps a little too outspoken for our modern times of prim gentility. Dr. Radcliffe, when dressing the gouty limbs of William the Third—the Prince of Orange—said, "I would not have your Majesty's two legs for your three kingdoms." Able as these illustrious physicians were, there was one amongst them who towered head and shoulders above them all, Dr. John Arbuthnot, who flourished in London in the time of Queen Anne, and who was a man of transcendant ability. His two principal works are an "Essay on Aliments," and another concerning the "Effects of Air on Human Bodies." The first of these points out that diseases might be as well cured by suitable diet and regimen as by drugs. The second work, discussing the effects of air on the human system, is declared by an able critic to be "one of the most remarkable books in the literature of medicine." From this work we gather the most comprehensive and instructive answer to the question regarding Impure Air, and the reason why it is so deadly is so clearly explained that every one can understand it, and no one who reads the explanation can ever forget it. Here it is:—

The reason why Impure Air is so terribly destructive to the Public Health is because it interferes with, hinders, delays, and almost prevents the Second Digestion.

According to Dr. Arbuthnot there are two digestions, the first and the second, quite distinct from each other, and with totally different characteristics. The stomach is the centre of the first digestion, and the lungs are the centre of the second digestion. The work of the first digestion is to convert the food into a liquid full of nourishment. But this liquid nourishment, no matter how abundant it may be, no matter how good the quality of it may be, is totally incapable by itself of sustaining life. The function of the second digestion is to convert the liquid nourishment into blood. This is done by exposing the liquid nourishment to the action of the air through the medium of the lungs. This is the second digestion, and there is not a more wonderful process in the human system. The dead product of the first digestion is converted in a moment by the second digestion into a vital fluid that courses merrily through the arteries to every point of the body, carrying with it health and strength and vigorous life. Without the second digestion the first digestion is of no use, and, however well fed a man may be, the value of the food he takes is most rigidly measured by the soundness of his second digestion, and the soundness of his second digestion depends on the quality of air he breathes. As Dr. Arbuthnot says in five graphic words, "*Respiration is the second digestion.*" The air may be so impure, as it sometimes is in coal-pits, as to stop the second digestion, when death immediately ensues. There are other degrees of impurity, not instantly fatal to life, but most disastrously injurious to health. A superficial observer walking through the narrow lanes and back streets where the poorest of the people live, would be apt to suppose the stunted growth, the pale faces, and the

frequent deformity among the children were caused by the want of food. He would be greatly mistaken. In the country where the children are not much if any better fed than the same class in towns, the youngsters run about with rosy cheeks and well developed bodies. Why? Because the second digestion goes on freely in the pure air, and every particle of nourisment handed over from the first digestion to the second, is instantly converted into blood and sent in health and strength giving streams to every part of the frame. Among the crofters in the Highlands where the supply of food is by no means abundant, the children are robust, healthy, and well made, thanks to the unimpeded work of the second digestion.

What is to be done to confer upon the children the vital benefits of the Second Digestion? The first step is to clear away the Smoke Pollution.

Three years ago great public meetings were held in Glasgow, under the presidency of the Lord Provost, for the promotion of Smoke Abatement. An executive committee with full powers was appointed to go practically into the work of investigation. The committee consisted of able, experienced, and highly respected citizens, and indeed no better committee could have been appointed. They had the services of a well qualified secretary and of an able and reliable engineer. But the sum they received from the public was only about a fourth part of what was required to do the work assigned to them. This was most disheartening to the committee, and compelled them to limit the area of their operations. It so happens that, from the nature of our business, we have found it necessary for more than twenty years to study most minutely, both in theory and practice, the best methods of producing perfect combustion. We have introduced into various important branches of industry, the means of producing heat of any required temperature without smoke or smell, and we have watched with close attention and hopeful interest the gradual introduction and improvement of mechanical stokers for steam boilers. We have investigated the merits and claims of between forty and fifty patent stokers, of both the sprinkling and coking types, and the researches of the executive committee do not appear to have extended beyond a dozen competitors among the patent stokers. Even although the committee had been unanimous in finding one of the dozen competing stokers decidedly the best, they, from their official position, would scarcely have ventured to announce the fact. After a much more extensive examination than it was possible for the committee to make, and undeterred by the dignified decorum of office, we have no hesitation in announcing the name of the stoker that we consider to be not only the best, but decidedly the best of the numerous machines in the market. It is the patent stoker of Mr. Thomas Henderson, of Liverpool. It is at once both a coking and sprinkling machine, cleverly combining the advantages of both systems, works smoothly, wears well, takes more heat out of the fuel than any other machine, can burn any kind of fuel, consumes the smoke, and is a permanent source of profit to every firm that applies it to their boilers. On the one hand it confers a great boon on the public by preventing smoke; and on the other hand it enables the user to secure a profit for himself at the same time that he bestows a great benefit on the community.

We shall be glad to send to any one who wishes it, full particulars regarding Mr. Henderson's machine.

Yours truly,

For the AIR BURNING CO., Limited,
PETER KING, *Secretary.*

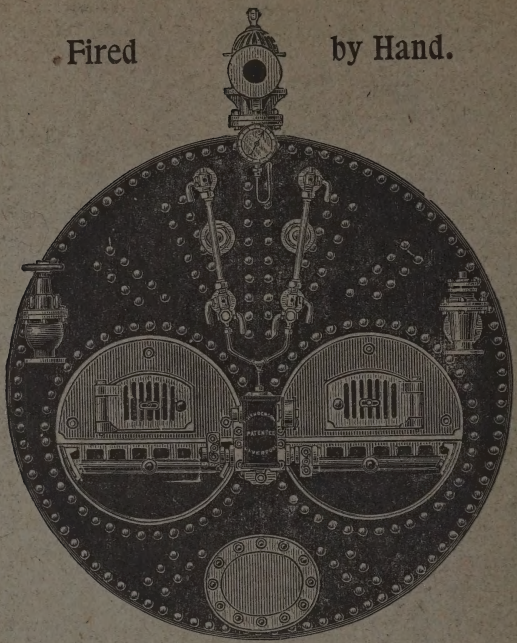
The Air Burning Company, Limited.

"THE above named Company dates its history from about the year 1870, and great success has attended the introduction of its specialities, which comprise patented apparatus for the generation and application of pure heat, from the mildest to the most intense, for all industrial and domestic purposes. At the present time these apparatus take the form principally of Gas Calenders, Gas Irons, Fans, and Laundry Appliances, for all of which the Company have achieved a very high reputation. Particular attention is being paid to the requirements of large modern laundries, which have been so greatly improved in recent years in the matter of equipment. The advantages derived from the use of the Air Burning Company's Irons are numerous and important. By their method a regular steady heat, at any required temperature, is obtained. The Iron can be heated, ready for use, at four minutes notice. The heat can be turned on or off, reduced or increased at pleasure, as easily as lighting or extinguishing a jet of gas. The iron being heated internally, the sole is always clean; and the irons are suitable for every class of work—from the finest to the heaviest. As no furnace is required, the ironer never needs to leave the table. One half more work can be done in a given time by this method than by any other, and a decidedly superior finish produced. Iron stains, so troublesome in ordinary ironing, are avoided entirely; the cost of heating is not one half the cost of the ordinary method, and the Company claim that, compared with those in ordinary use, their irons will, in the hands of competent and regular workers, effect in labour alone a saving of £10 yearly on each iron. Many favourable comments have been passed upon these excellent ironing apparatus in the press, and testimonials in great numbers have been received by the Company, all in terms of high praise. Among the awards granted to the Company's appliances are the Medal and Diploma of the Philadelphia Centennial Exhibition, 1876; and the Glasgow Philosophical Society's Certificate of Honourable Mention, 1880. The fact that over six thousand of the Company's Irons are now in use, giving entire satisfaction, is perhaps the best proof of their high practical efficiency. They are to be found in many of the principal laundry establishments in the country; and a notable example of the many important contracts the Company have executed in this way, is presented by the Great Western Steam Laundry, at Glasgow (Jordanhill), reputed to be the largest and most complete in the kingdom, where the Air Burning Company have fitted no less than one hundred and fifty Gas and Air Irons. The Company are also large makers of heating apparatus for Calenders, to which they apply their patented method with great success. They do an immense and increasing trade, and their specialities have been sent as far as Australia. The affairs of the Company are admirably administered, and Mr. PETER KING is Secretary of the Company.

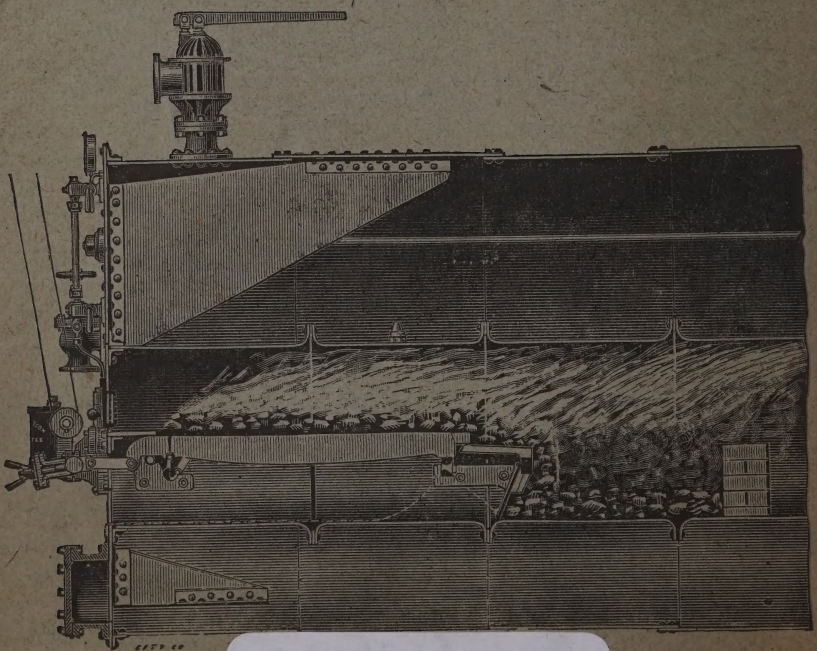
"This enterprising Company has just added another important department to their business, a department in which they will undertake to supply the public with the best and most economical Mechanical Stokers for steam boilers. They say, 'We have no hesitation in announcing the name of the Stoker that we consider to be not only the best, but decidedly the best, of the numerous machines in the market. It is the Patent Stoker of Mr. THOMAS HENDERSON, of Liverpool.' We understand the Air Burning Company have been appointed Agents for Scotland and Ireland, for Mr. HENDERSON'S Patent Stokers and Furnaces."—*Rivers of the North.*

Henderson's Patent Self-cleaning Fire Bars.

Fired by Hand.



Elevation.



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